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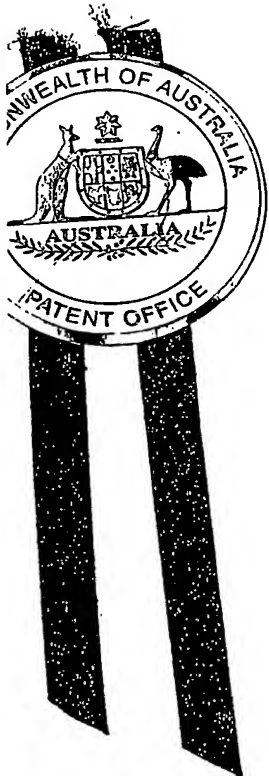
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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003900291 for a patent by HEAD ELECTRICAL INTERNATIONAL PTY LTD as filed on 20 January 2003.



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Second day of February 2004

J. Billingsley

JULIE BILLINGSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

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PROVISIONAL SPECIFICATION

Applicant(s):

HEAD ELECTRICAL INTERNATIONAL PTY LTD
A.C.N. 093 143 027

Invention Title:

ELECTRICAL CONNECTION DEVICE

The invention is described in the following statement:

ELECTRICAL CONNECTION DEVICE

Field of the Invention

5 The present invention broadly relates to an electrical connection device for a machine, reeling or trailing cable.

Background of the invention

10 Machine, reeling or trailing cables are typically used to provide an electrical connection for mobile electrical machines. For example, in the mining or petroleum industry often large electrical machinery is used and each machine, reeling or trailing cable may have
15 to provide power in the order of a few hundred kilowatts. Typically such power is delivered with a voltage of one or more kilovolts and are usually formed from a plurality of bunches and the cables are connected using electrical connection devices including sockets and pins.

20 Figure 1 shows a schematic cross-sectional representation of a typical prior art electrical connection device 10. The device 10 comprises a housing 12 in which a socket 14 and a pin 16 engage. The socket 14 is metallic and includes six fingers 18 and a compression
25 spring 19 is arranged to press the fingers 18 and/or tips of the fingers against the pin 16 to establish an electrical connection. However, the compression spring 19 may loose tension over time, in particular when the electrical connection device is exposed to a heat source
30 or when large currents flow through the device which may result in heat development.

- 3 -

Summary of the Invention

Broadly defined the present invention provides an electrical connection device including:

- a pin and a socket, the pin and the socket being
5 moveable relative to each other from a released position to an engaged position, at least one of the pin and the socket having a marginal portion that is compressible or expandable in at least one direction and
- a wedge portion arranged such that, when the pin and the
10 socket are moved relative to each other towards the engaged position, the wedge portion expands or compresses the marginal portion whereby the pin and the socket engage.

As the pin or the socket is wedged against the socket
15 or the pin, respectively, the electrical connection device has the advantage that a firm electrical connection can be established without a compression spring. Further, the engagement may be stronger than that of typical prior art devices.

20

Preferred Features of the Invention

The electrical connection device preferably has at least one gap through the marginal portion that expands or reduces when the marginal portion is expanded or
25 compressed respectively.

The marginal portion preferably is a part of the socket. In this case the wedge portion preferably is arranged such that, when the pin and the socket are moved relative to each other to the engaged position, the wedge
30 portion compresses the marginal portion against the pin whereby the pin and the socket engage. The socket preferably is of a longitudinal shape and the marginal portion preferably is an end-portion of the socket.

- 4 -

The wedge portion preferably is composed of a flexible material that most preferably is resilient. The flexible material may be a polymeric material and preferably is a rubber.

5 In a preferred embodiment of the present invention the pin and the socket are of a generally round cross-section. The socket and the pin preferably are, when in the engaged position, surrounded by a sleeve. The pin preferably is secured in the sleeve. The wedge portion
10 preferably is provided in form of a ring-like portion positioned such that, when the pin and the socket are moved relative to each other towards the engaged position, the wedge portion wedges the end-portion of the socket against the pin. This embodiment has the advantage that
15 the socket may be fitted over the pin without much frictional resistance. Only when the pin and the socket have been moved relative to each other such that the engaged position is almost reached, the wedge portion wedges the end-portion of the socket towards the pin and
20 therefore imposes greater friction.

 The socket may have an inner surface that has a substantially uniform diametrical dimension throughout its length. However, the inner surface preferably has a tapered region. In this case the tapered region may
25 separate a region of a smaller interior diameter from a region of a larger interior diameter. The region of the smaller interior diameter preferably is arranged for frictional engagement with the pin and most preferably is not positioned at an end of the inner surface.

30 The pin may have an outer surface that is of a substantially uniform diametrical dimension. Alternatively, the outer surface may have a tapered region. In this case the tapered region may separate a

- 5 -

region of a larger exterior diameter from a region of a smaller exterior diameter. The region of the larger exterior diameter preferably is arranged for frictional engagement with the socket and most preferably is not positioned at an end of the outer surface.

In a preferred embodiment of the present invention, the socket has an inner surface that has a tapered region and a region of smaller interior diameter. In this embodiment the pin has an outer surface that has a substantially uniform diametrical dimension. In this case the region of the smaller interior diameter preferably is positioned such that, when the wedge portion wedges the end-portion of the socket against the pin, the contact area between pin and socket increases to predetermined size. In electrical connection devices known in the prior art (see Figure 1), the socket may contact the pin at the tip of the fingers of the socket and the electrical contact area may be relatively small. In the above described preferred embodiment of the present invention the tapered shape of the inner surface of the socket or of the outer surface of the pin, respectively, may overcome this disadvantage and may, together with the wedging function of the wedge portion, result in a relatively larger contact area between the pin and the socket.

The gap preferably is one of a plurality of longitudinal gaps that split the socket into three or more fingers which preferably are substantially equal.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings.

Brief description of the Drawings

Figure 1 shows a schematic cross-sectional

- 6 -

representation of an electrical connection device (prior art),

Figure 2 shows a schematic cross-sectional representation of an electrical connection device according to an embodiment of the present invention.

Figure 3 shows another schematic cross-sectional representation of the electrical connection device

Figure 4 shows a schematic representation a part of the preferred electrical connection device ((a) top view and (b) cross-sectional view) and

Figure 5 shows a schematic representation of a socket that forms a part of the preferred electrical connection device ((a) side view and (b) top view).

15 Detailed Description of a Preferred Embodiment

Referring to Figures 2 to 5, the electrical connection device 20 is now described. Figure 2 shows the electrical connection device 20 including a socket 22 connected to a pin 24. The pin 24 and the socket 22 are arranged for connection to a thimble (not shown) and the thimbles are arranged to receive electrical leads. Socket 22, pin 24 and thimbles are located in a housing 28. The socket 22, the pin 24 and the thimbles are composed of a metallic material. The device 20 comprises a wedge portion 25 that has a ring-like shape and is composed of a flexible material such as a polymeric material. Figure 4 shows the wedge portion 25 as viewed from the top (a) and in cross-section (b).

The socket 22 has an inner surface 30 arranged to receive the pin 24. The inner surface 30 of the socket 22 has a tapered region which is shaped such that there is a region 31 of smallest interior diameter.

Figure 5 shows the socket 22 ((a) side-view, (b) top-

- 7 -

view). The socket has an end-portion 29 that is compressible and that has four fingers 32. The fingers 32 are separated by gaps 34 and each finger 32 has an angled region 36.

5 Pin 24 and socket 22 are moveable relative to each other by moving the socket 22 relative to the pin 24 and the housing 28. The pin 24 is secured in the housing 28. When the socket has been moved into the housing 28 and over the pin 24, as shown in Figures 2 and 3, the angled
10 region 36 will be in contact with the ring-like wedge-portion 25. The wedge-portion 25 wedges the angled regions 36 of the fingers 32 inwardly such that a firm electrical contact is established between the inner surface 30 of the socket 22 and the pin 24. Arrows in Figure 3 schematically
15 indicate mechanical forces during the wedging process.

Although the invention has been described with reference to particular examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms. For example, in an
20 alternative embodiment the inner surface of the socket may be straight and the pin may have an outer surface that is also straight or that may be tapered. Further, the pin may include an end-portion that is expandable and arranged to expand when the socket is moved over the pin. In this case
25 the end-portion of the pin may include fingers and a wedge-portion may be centrally located at the bottom part of the inner surface of the socket and arranged to wedge the fingers of the pin outwardly against the inner surface of the socket.

- 8 -

The Claims defining the Invention are as follows:

1. An electrical connection device including:
 - a pin and a socket, the pin and the socket being
5 moveable relative to each other from a released position to an engaged position, at least one of the pin and the socket having a marginal portion that is compressible or expandable in at least one direction and
 - a wedge portion arranged such that, when the pin and the
10 socket are moved relative to each other towards the engaged position, the wedge portion expands or compresses the marginal portion whereby the pin and the socket engage.
- 15 2. The electrical connection device as claimed in claim 1 having at least one gap through the marginal portion that expands or reduces when the marginal portion is expanded or compressed respectively.
- 20 3. The electrical connection device as claimed in claim 1 or 2 wherein the socket includes the marginal portion.
4. The electrical connection device as claimed in claim 3 wherein the wedge portion is arranged such that, when
25 the pin and the socket are moved relative to each other to the engaged position, the wedge portion compresses the marginal portion against the pin whereby the pin and the socket engage.
- 30 5. The electrical connection device as claimed in claim 3 or 4 where dependent on claim 3 wherein the socket is of a longitudinal shape and the marginal portion is an end-portion.

- 9 -

6. The electrical connection device as claimed in any one of the preceding claims wherein the wedge portion comprises a flexible material.

5

7. The electrical connection device as claimed in claim 6 wherein the flexible material is a polymeric material.

8. The electrical connection device as claimed in claim 6 or 7 wherein the flexible material is a rubber.

10

9. The electrical connection device as claimed in any one of the preceding claims wherein the pin and the socket are of a generally round cross-section.

15

10. The electrical connection device as claimed in any one of the preceding claims wherein the wedge portion is provided in form of a ring-like portion positioned such that, when the pin and the socket are moved relative to each other towards the engaged position, the wedge portion wedges the end-portion of the socket against the pin.

20

11. The electrical connection device as claimed in any one of the preceding claims wherein the pin and the socket, when engaged, are surrounded by a sleeve.

25

12. The electrical connection device as claimed in claim 11 wherein the pin is secured in the sleeve.

13. The electrical connection device as claimed in any one of the preceding claims wherein the socket has an inner surface that has a substantially uniform internal diametrical dimension.

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- 10 -

14. The electrical connection device as claimed in any one of claims 1 to 12 wherein the socket has an inner surface that has a tapered region.

5

15. The electrical connection device as claimed in claim 14 wherein the tapered region separates a region of smaller interior diameter from a region of larger interior diameter.

10

16. The electrical connection device as claimed in claim 15 wherein the region of smaller interior diameter is not positioned at an end of the inner surface.

15 17. The electrical connection device as claimed in claim 16 wherein the region of smaller interior diameter is arranged for frictional engagement with the pin.

18. The electrical connection device as claimed in any one of the claims 1 to 10 wherein the pin has an outer surface that has a substantially uniform external diametrical dimension.

19. The electrical connection device as claimed in any one of the claims 1 to 12 wherein the pin has an outer surface that has a tapered region.

20. The electrical connection device as claimed in claim 19 wherein the tapered region separates a region of smaller exterior diameter from a region of larger exterior diameter.

21. The electrical connection device as claimed in claim

- 11 -

20 wherein the region of larger exterior diameter is arranged for frictional engagement with the socket.

22. The electrical connection device as claimed in claim 5 20 or 21 wherein the region of larger exterior diameter is not positioned at an end of the outer surface.

23. The electrical connection device as claimed in any one of claims 3 to 22 when dependent on claim 2 wherein 10 the gap is one of a plurality of longitudinal gaps that split the socket into three or more fingers.

24. The electrical connection device as claimed in claim 15 23 wherein the fingers are substantially equal.

DATED this 17th day of JANUARY 2003
HEAD ELECTRICAL INTERNATIONAL PTY LTD
By their Patent Attorneys
GRIFFITH HACK

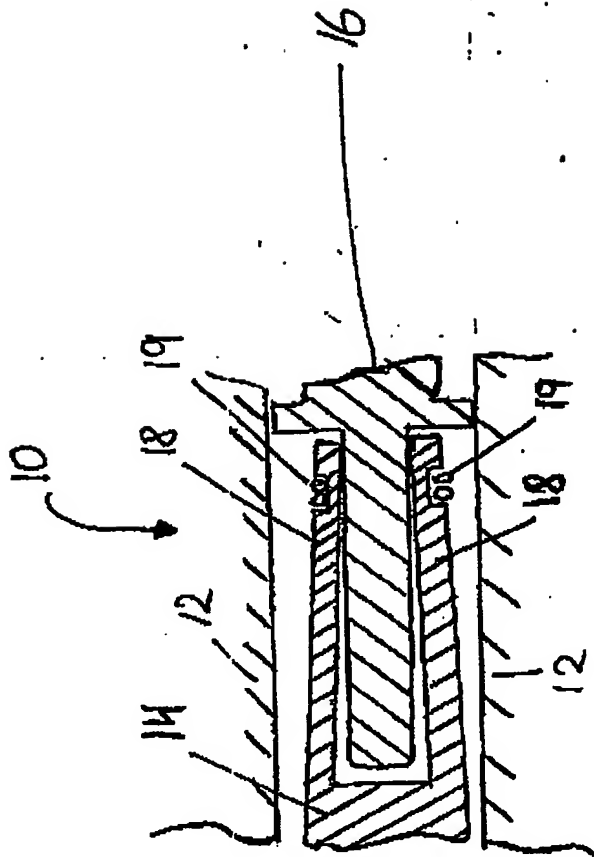


FIG. 1

prior art

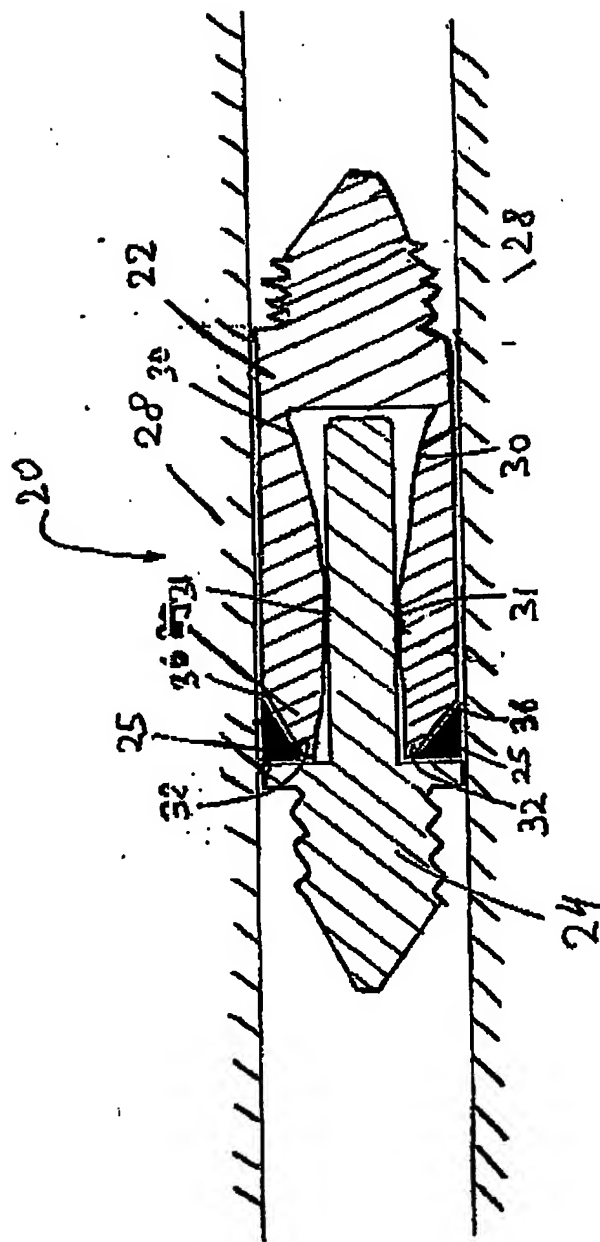


FIG. 2

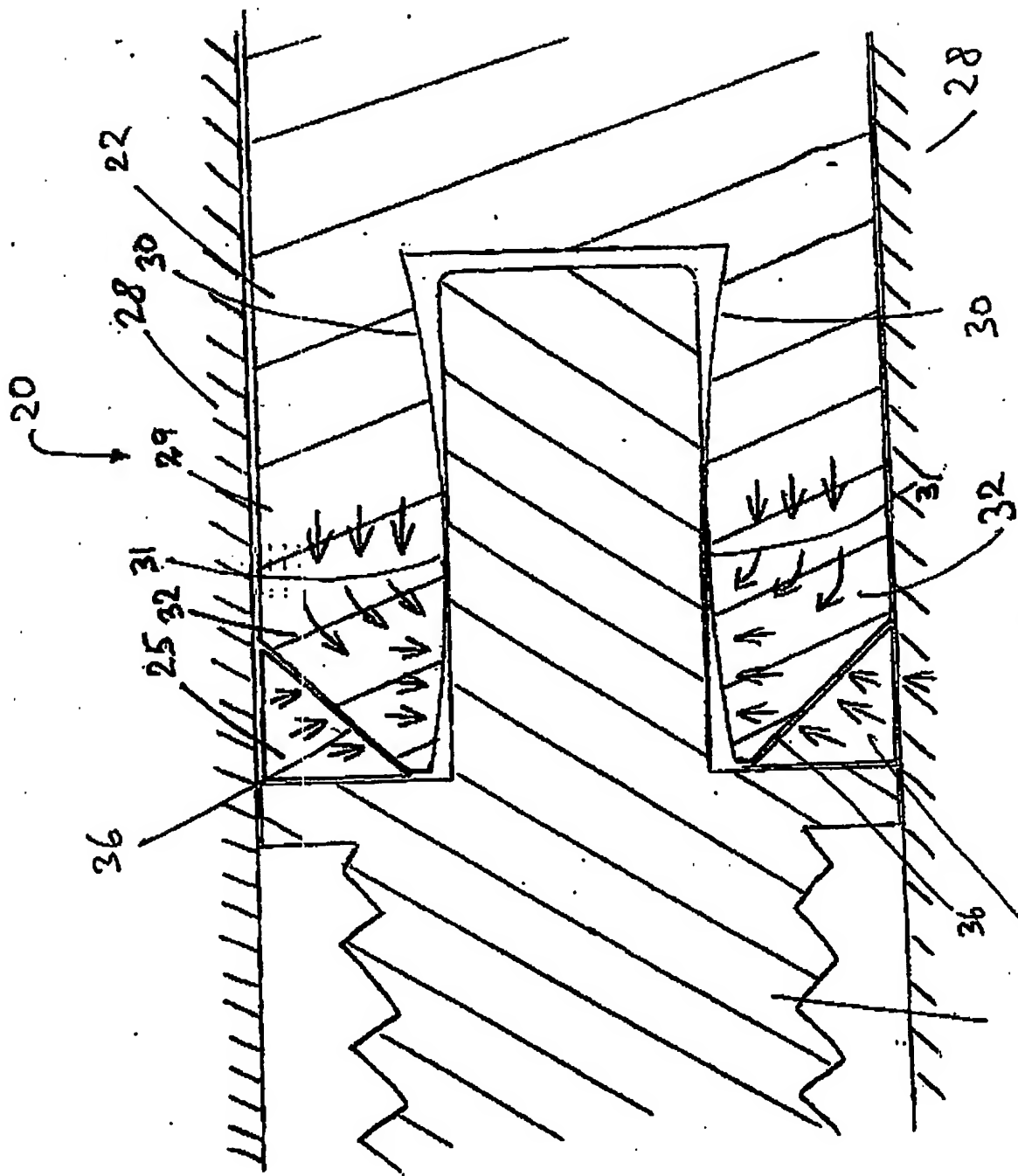


FIG. 3

24 25

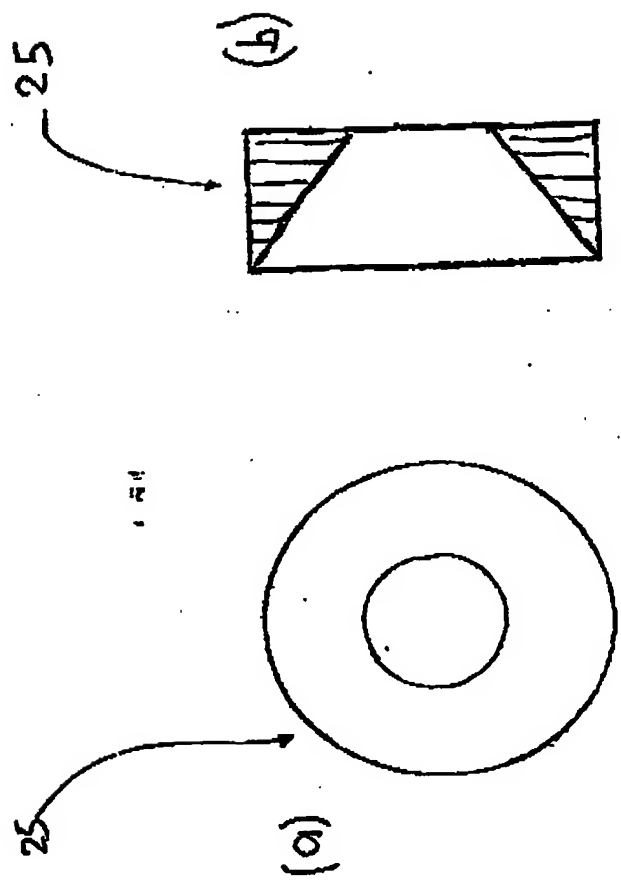


FIG. 4

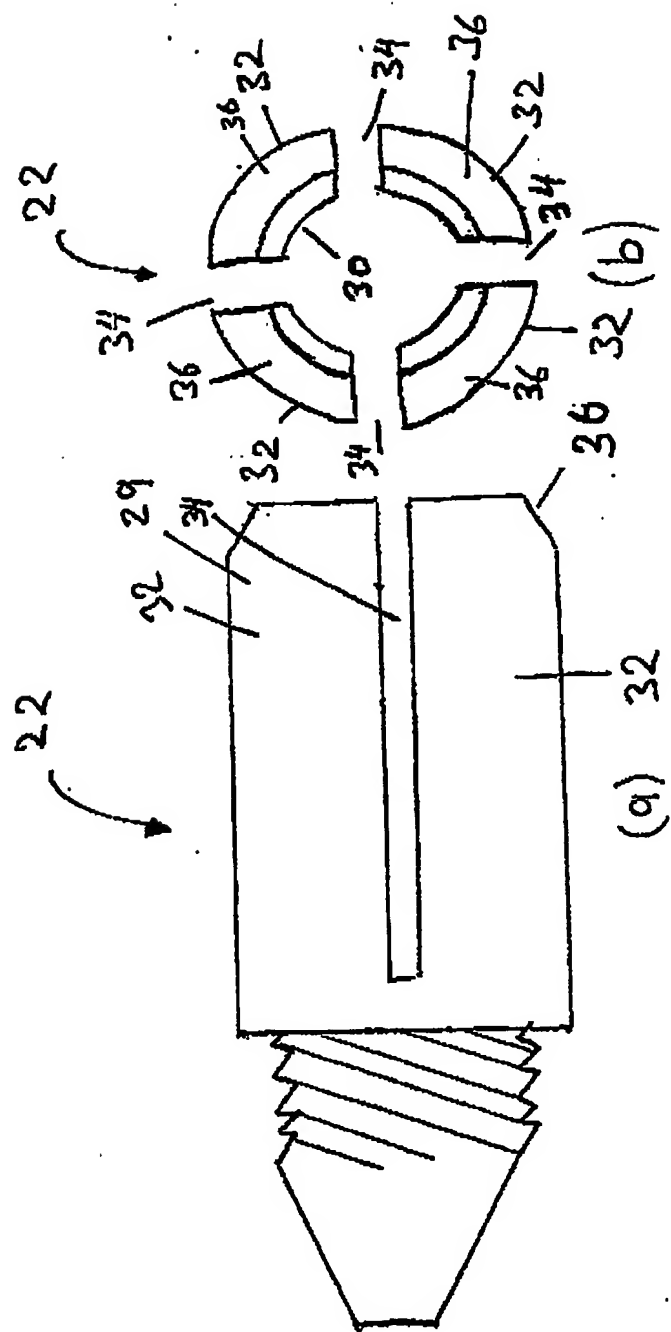


FIG. 5

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